



New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ETHYLENE OXIDE**

CAS Number: 75-21-8
DOT Number: UN 1040

RTK Substance number: 0882
Date: December 1994 Revision: May 2001

HAZARD SUMMARY

- * **Ethylene Oxide** can affect you when breathed in.
- * **Ethylene Oxide** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- * **Ethylene Oxide** can cause reproductive damage. Handle with extreme caution.
- * Contact can severely irritate and burn the skin and eyes with possible eye damage.
- * Contact with undiluted liquid can cause frostbite.
- * Breathing **Ethylene Oxide** can irritate the nose and throat.
- * Breathing **Ethylene Oxide** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- * High exposure to **Ethylene Oxide** can cause headache, nausea, vomiting, dizziness, twitching and seizures.
- * **Ethylene Oxide** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- * High or repeated exposure may damage the nerves causing weakness, "pins and needles," and poor coordination in the arms and legs.
- * **Ethylene Oxide** may damage the liver and kidneys.
- * **Ethylene Oxide** is a HIGHLY FLAMMABLE and REACTIVE chemical and a DANGEROUS FIRE and EXPLOSION HAZARD.

IDENTIFICATION

Ethylene Oxide is a colorless gas or liquid with a sweet *Ether*-like odor. It is used to make other chemicals, and as a sterilant and fumigant.

REASON FOR CITATION

- * **Ethylene Oxide** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, NTP, DEP, IARC, NFPA and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and **MUTAGEN** and is **FLAMMABLE** and **REACTIVE**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
- * **ODOR THRESHOLD = 420 ppm.**
- * The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm**, not to be exceeded during any 15-minute work period.

NIOSH: The recommended airborne exposure limit is less than **0.1 ppm** averaged over a 10-hour workshift and **5 ppm**, not to be exceeded during any 10-minute period per day.

ACGIH: The recommended airborne exposure limit is **1 ppm** averaged over an 8-hour workshift.

- * **Ethylene Oxide** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * A regulated, marked area should be established where **Ethylene Oxide** is handled, used, or stored as required by the OSHA Standard: 29 CFR 1910.1047.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Ethylene Oxide** and at the end of the workshift.
- * On skin contact with **Ethylene Oxide**, immediately submerge the affected body part in warm water.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Ethylene Oxide** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Ethylene Oxide**:

- * Contact can severely irritate and burn the skin and eyes with possible eye damage.
- * Contact with undiluted liquid can cause frostbite.
- * Breathing **Ethylene Oxide** can irritate the nose and throat.
- * Breathing **Ethylene Oxide** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- * High exposure to **Ethylene Oxide** can cause headache, nausea, vomiting, dizziness, twitching and seizures.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Ethylene Oxide** and can last for months or years:

Cancer Hazard

- * **Ethylene Oxide** is a CARCINOGEN in humans. There is some evidence that it causes leukemia in humans and it has been shown to cause leukemia and stomach cancer in animals.
- * Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

- * **Ethylene Oxide** may damage the developing fetus.
- * **Ethylene Oxide** may damage the testes (male reproductive glands).

Other Long-Term Effects

- * **Ethylene Oxide** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- * High or repeated exposure may damage the nerves causing weakness, "pins and needles," and poor coordination in the arms and legs.
- * **Ethylene Oxide** may damage the liver and kidneys.
- * **Ethylene Oxide** can irritate the lungs. Repeated exposure may cause bronchitis to develop with cough, phlegm, and/or shortness of breath.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater), the following is recommended before beginning work and at regular times after that:

- * Exam of the nervous system.

If symptoms develop or overexposure is suspected, the following are recommended:

- * Evaluation by a qualified allergist, including careful exposure history and special testing, may help diagnose skin allergy.
- * Consider chest x-ray after acute overexposure.
- * Liver and kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

- * Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- * Because more than light alcohol consumption can cause liver damage, drinking alcohol may increase the liver damage caused by **Ethylene Oxide**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- * Where possible, automatically transfer gaseous **Ethylene Oxide** or pump liquid **Ethylene Oxide** from cylinders or other storage containers to process containers.
- * Before entering a confined space where **Ethylene Oxide** may be present, check to make sure that an explosive concentration does not exist.
- * Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA Standard: 29 CFR 1910.1047.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Ethylene Oxide** should change into clean clothing promptly.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Ethylene Oxide**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.
- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Ethylene Oxide**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Ethylene Oxide**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Ethylene Oxide** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Ethylene Oxide**. Wear protective gloves and clothing. Safety equipment suppliers/

manufacturers can provide recommendations on the most protective glove/clothing material for your operation.

- * Where exposure to cold equipment, vapors, or liquid may occur, employees should be provided with special clothing designed to prevent the freezing of body tissues.
- * ACGIH recommends *Nitrile* as a protective material.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
- * Wear indirect-vent, impact and splash resistant goggles when working with liquids.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
- * Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * Where the potential exists for exposure over **0.1 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- * Exposure to **800 ppm** is immediately dangerous to life and health. If the possibility of exposure above **800 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

- * Prior to working with **Ethylene Oxide** you should be trained on its proper handling and storage.
- * A regulated, marked area should be established where **Ethylene Oxide** is handled, used, or stored.
- * **Ethylene Oxide** must be stored to avoid contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); CHLORIDES of IRON, ALUMINUM, and TIN; IRON and ALUMINUM OXIDES; METALLIC POTASSIUM; MERCAPTANS; AMMONIA; and AMINES since violent reactions occur.

- * Store in tightly closed containers in a cool, dry, well-ventilated area away from HEAT, SPARKS, SUNLIGHT and WATER.
- * Sources of ignition, such as smoking and open flames, are prohibited where **Ethylene Oxide** is used, handled, or stored.
- * Metal containers involving the transfer of **Ethylene Oxide** should be grounded and bonded.
- * Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethylene Oxide**.
- * Wherever **Ethylene Oxide** is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.
- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.
- Q: Don't all chemicals cause cancer?
- A: No. Most chemicals tested by scientists are not cancer-causing.
- Q: Should I be concerned if a chemical causes cancer in animals?
- A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.
- Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
- A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.
- Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
- A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.
- Q: Who is at the greatest risk from reproductive hazards?
- A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.
- Q: What are the likely health problems from chemicals which cause mutations?
- A: There are two primary health concerns associated with mutagens: (1) cancers can result from changes induced in cells and, (2) adverse reproductive and developmental outcomes can result from damage to the egg and sperm cells.
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- The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-2202. (609) 292-5677 (fax)
- Web address: <http://www.state.nj.us/health/eoh/odisweb/>
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DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

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